LERMAN SENTER PLLC

WASHINGTON, DC

July 6, 2009

Filed Electronically

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: FM HD Radio System Performance At Elevated Digital Carrier Levels Test Reports
MM Docket 99-325

Dear Ms. Dortch:

Charles River Broadcasting Company, a subsidiary of Greater Media Inc. and licensee of station WKLB-FM, Waltham, Massachusetts (Facility ID No. 10542), by its attorneys, submits the attached HD Radio testing reports for inclusion in the above-captioned docket.

The reports provide data gathered through additional FM HD Radio testing conducted by station WKLB-FM and iBiquity Digital Corporation. The test procedures analyzed WKLB-FM's digital performance at various power levels ranging from the current FM digital power limit of -20 dBc up to and including operation at -10 dBc, the power limitation under consideration in this proceeding.

The reports provide additional evidence that an increase in HD Radio digital power is required to enable FM broadcast stations to provide digital service that replicates their analog service contours with comparable indoor reception. The reports also demonstrate that a power increase to less than -14 dBc would provide little, if any, improvement to FM HD Radio's current reception issues.

Respectfully submitted,

Steven A. Lerman
John W. Bagwell

Attachments

FM HD Radio™ System Performance

At

Elevated Carrier Levels

June 30, 2009

Charles River Broadcasting Company

iBiquity Digital Corporation

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1 Background and Test Observations

On December 4, 2008 Charles River Broadcasting Company (Charles River), licensee of WKLB-FM Waltham, MA, was granted experimental authority by the FCC (file number 20081031ACO) to operate with digital carrier levels up to and including -10 dBc. This permitted WKLB to operate with digital power levels up to and including 10 dB above that currently permitted by the Commission's rules. WKLB has operated at various elevated digital power levels during the duration of the experimental authority and recently filed an interim report with the Commission, coincident with its request for an extension of such authority, detailing its observations during this period. It was noted in the interim report that WKLB would shortly be conducting additional testing to better quantify the actual improvements occasioned by operation at the elevated digital power levels.

During the past month, Charles River, with the assistance and cooperation of iBiquity Digital Corporation (iBiquity), the developer of the HD Radio™ system, has conducted extensive field testing in an effort to quantify improvements in the WKLB digital service occasioned by increasing power to several discrete levels. Although a number of studies have been previously submitted detailing coverage improvement over a specific route or routes, it is believed that the instant report (see "FM HD Radio System Performance at Elevated Carrier Levels", immediately following) is the first to comprehensively quantify such improvements over an entire metropolitan area.

Four heavily traveled radials routes (I-90, I-93, I-95 and State Route 3) and a circular "beltway" (I-495) that encircles much of the Boston metropolitan area were chosen to gain knowledge of digital signal improvements over the entire market. The mobile test platform employed was identical in equipment and configuration to that used for the initial NRSC testing in 2002 and for the more recent testing conducted on Greater Media stations WRAT, WJRZ, WDHA and WCSX as well as several other non Greater Media owned facilities. Results of these tests have been previously submitted to the Commission over the course of the digital radio proceeding. A JVC Model KD-HDR50 receiver was used to determine whether digital reception was possible at any point on a route. This receiver was previously characterized as being "typical" and meeting its published performance specification by iBiquity. Data as to time, location, spectral content and reception mode (analogue or digital) was recorded on a micro computer using a proprietary iBiquity data collection program. The receiving antenna was a conventional 31" whip mounted in the center of roof of the test vehicle. All data on each route, for each power level was recorded with the test vehicle proceeding in the same direction. The data collected represents several thousand miles of vehicle operation.

Referencing figure 1 in the attached report, it can be plainly seen that at the currently authorized -20 dBc power level there are significant and serious digital coverage deficiencies within the WKLB-FM 54 dBu protected analogue contour on all routes measured. It should be emphasized that the "cliff edge" propagation characteristics of digital signals, and specifically IBOC digital radio signals, make ANY loss of the digital signal, even momentary, extremely irritating to the listener. The effect is not one to which a listener is accustomed, such as multipath or picket fencing, where the audio is still available, albeit compromised. A listener to an HD-1 channel will sense a fall back to the underlying analogue signal which is likely blended to mono and/or experiencing high frequency roll off resultant from circuitry included in virtually every analogue auto radio, resulting in the loss of stereo perspective and a significant decrease in fidelity. The situation with HD-2 and HD-3 channels is worse; the signal is simply gone – lost. More than an extremely occasional instance of any such impairment will cause listeners to seek another audio entertainment option. A close examination of each route will show multiple and numerous instances of intermittent loss of digital service, even prior to those areas where digital service is largely absent.

Figure 2, representing service at -14 dBc (6 dB above the currently authorized digital power level), shows significant improvement on all routes but also shows evidence of occasional losses of the digital signal within the underlying analogue 54 dBu protected contour, again even prior to those remaining areas where the digital signal is more seriously compromised. Attention is directed to I-93 (between I-495 and the 54 dBu contour), I-495 (from I-93 to the 54 dBu contour) and even I-90 (immediately west of I-495). All these areas exhibit multiple momentary digital signal drop outs, well within the seamless analogue coverage area of WKLB. Clearly, operation at -14 dBc provides significant improvement, but *fails* in terms of replication of analog signal coverage, an absolute requirement if digital radio is to be the successor to that service and the key to listener satisfaction and acceptance.

Figure 3, representing service at -10 dBc (10 dB above the currently authorized digital power level), shows marked improvement in digital service, as compared to Figure 2. Other than terrain shadowed area in the Providence/Pawtucket and Plymouth areas, digital reception is virtually flawless over the various routes. It is *extremely* important to observe that, other than those areas just noted, there are virtually NO areas where any momentary digital signal drop outs are evident. This is the level of service a listener anticipates and expects. This is the level of service necessary to ensure the continuing successful roll out of digital radio.

Conclusions

Clearly, digital radio service at the currently authorized power of level of -20 dBc does not come close to providing the robustness and quality of service anticipated and expected by listeners, even based on an analogue reference point. This first-of-its-kind survey of an entire metropolitan area proves that fact beyond any reasonable doubt. Station operation at -14 dBc, a four times digital power increase, substantially improves digital coverage but still does not provide either flawless digital service nor replication of the underlying analogue service area, two very basic and critical listener expectations. Station operation at a -10 dBc level, as proposed by the joint parties, DOES result in largely impairment free coverage and replication of analogue service. It is critical to understand that the failure mode of a digital radio signal is dramatic and unfamiliar to a listener representing a total loss of service. Such irritants must be absolutely minimized if listener expectations are to be met.

2 Overview

This report documents recent field tests of iBiquity Digital Corporation's FM HD Radio™ system. The tests were designed to assess the system's performance with an increase in the ratio of digital power to analog power. These tests compare the system performance at current power levels (digital power 20 dB below analog power) with elevated power levels (digital power 10 dB and 14 dB below analog).

2.1 IBOC Signal

For these tests, the system operated in the hybrid mode, which contains the analog FM signal and service mode MP3 digital carriers. Figure 1 illustrates digital carriers at -20 dBc and the FCC and iBiquity emission masks. The IBOC analog to digital carrier ratio is shown in a resolution test bandwidth of 1 kHz, which is far less than the total integrated power bandwidth of 140 kHz for the digital carriers. The -41.46 dBc ratio indicated in Figure 1 is calculated from the desired -20 dBc total integrated power ratio as follows:

$$P_{RBW\ Test} = P_{Total} - (10\ Log_{10}(RBW_{Test} / RBW_{Total}))$$

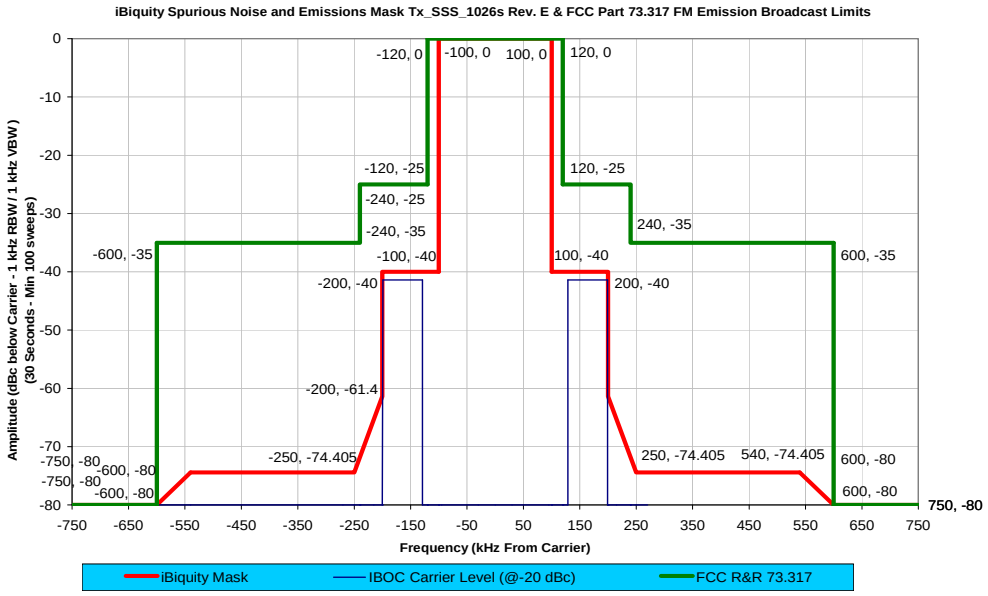


Figure 1 - FM Hybrid IBOC Spectral Test Mask @ -20 dBc

Figure 2 shows the RF spectrum from the forward sample port of a dual-input antenna, and the iBiquity spurious noise and emissions mask. The FCC Part 73.317 emission limit mask is not shown, as the iBiquity mask meets the FCC specification by a large margin.

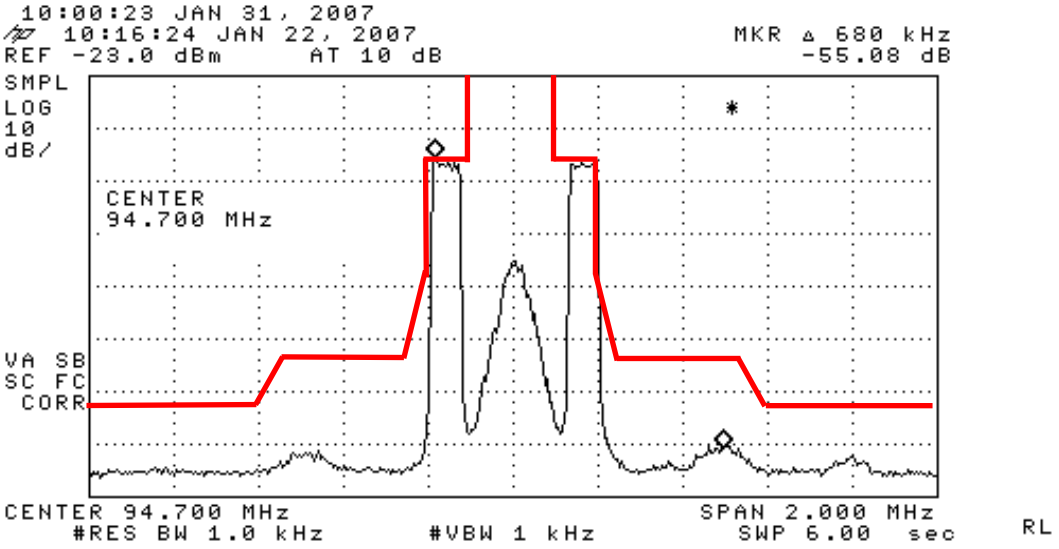


Figure 2 – Typical FM Hybrid IBOC Spectrum @ -20 dBc

Figure 3 shows the digital carriers at 10 dB below analog power levels with both the FCC and iBiquity masks. The digital sidebands will exceed the current iBiquity mask by about 8.5 dB. The digital sidebands comply with the FCC mask.

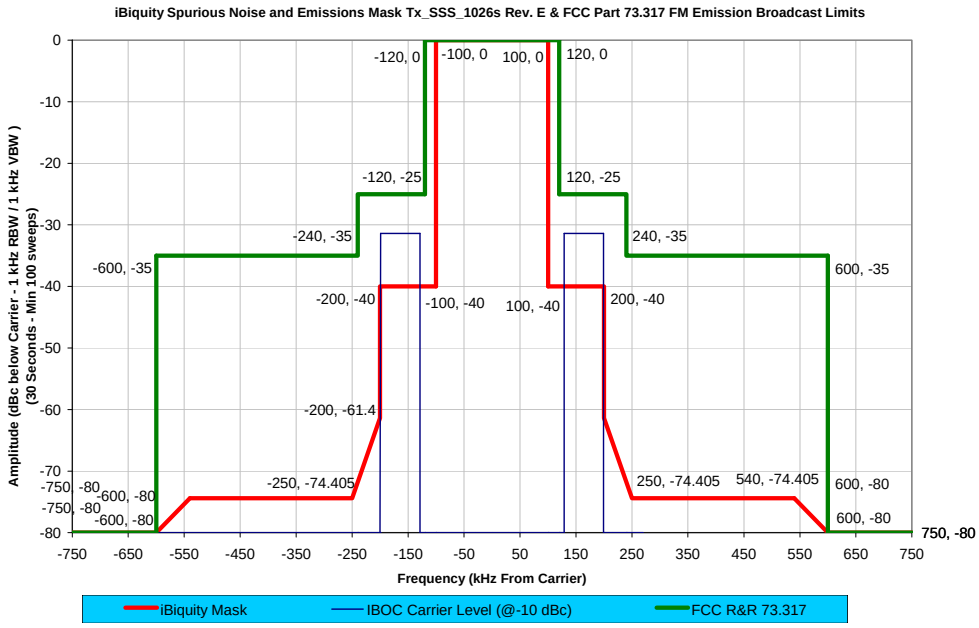


Figure 3 - FM Hybrid IBOC Spectral Test mask @ -10 dBc

Figure 4 shows the RF spectrum from the same sample point as Figure 2. As shown in Figure 3, the sideband power exceeds the current iBiquity digital mask in the frequency range of ±129 to ±199 kHz. Even at the -10 dB power level, the IBOC transmitter is capable of meeting or exceeding the iBiquity mask thresholds established for the -20 dB power level.

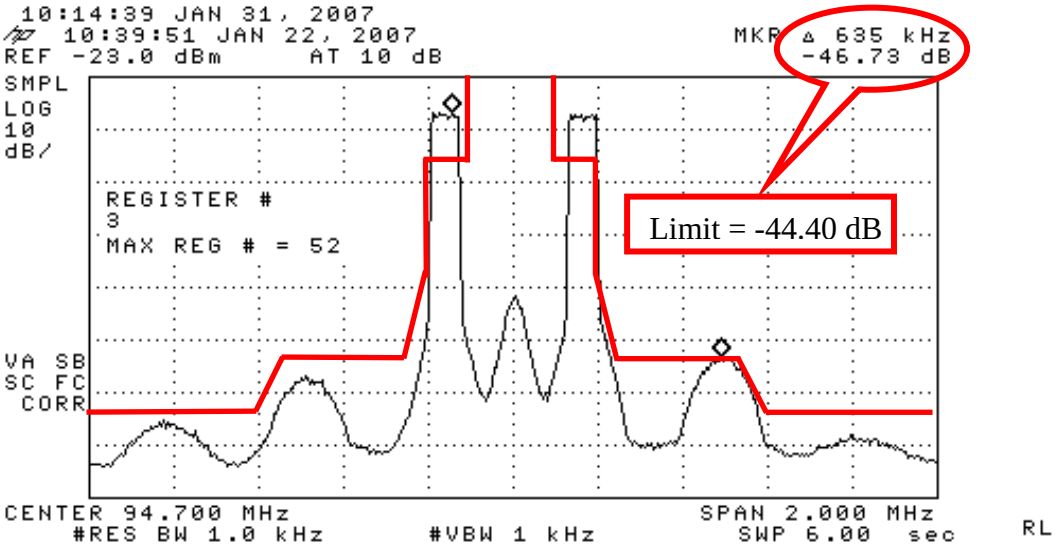


Figure 4 – Typical FM Hybrid IBOC Spectrum @ -10 dBc

2.2 Transmitter Test Site

These tests were conducted using the RF transmission facilities of WKLB, Waltham, MA (Boston).

WKLB was granted experimental authority under 47CFR 73.1510(d) to operate with digital power levels up to and including 10 dB above currently authorized levels.

Please note that WKLB's total integrated digital power is increased by 0.79 dB over the reference -20 / -14 / -10 dBc levels to accommodate the additional carriers present in transmission Mode MP3.

Transmission Facility Information

FCC Facility ID:	10542
North Latitude	42° 18' 37"
West Longitude	71° 14' 14"

High Power IBOC authority per 47CFR 73.1510(d) granted 12/4/08

Radiation Parameters

AGL	290 m	
G AMSL	30 m	
RC AMSL	320 m	
HAAT	272.27 m	
ERP (Analog)	14.0 kW	
ERP (Digital)	167.91 W	(-19.21 dBc D/A Ratio – Mode MP3)
ERP (Digital)	670.17 W	(-13.21 dBc D/A Ratio – Mode MP3)
ERP (Digital)	1679.1 W	(-9.21 dBc D/A Ratio – Mode MP3)

Antenna

ERI Model 1183-4CP-2 Dual-Input Hybrid IBOC

2.3 Operating Power

For these tests, WKLB chose to operate each transmitting facility at various total power levels from 20 dB to 10 dB below that of the reference analog carrier. The digital to analog power ratio was verified using digital power meters and transmission system loss / antenna gain calculations supplied by the equipment manufacturers.

2.4 Antenna Configuration

WKLB uses an ERI Model 1183-4CP-2 Dual-Input Hybrid IBOC Panel Antenna

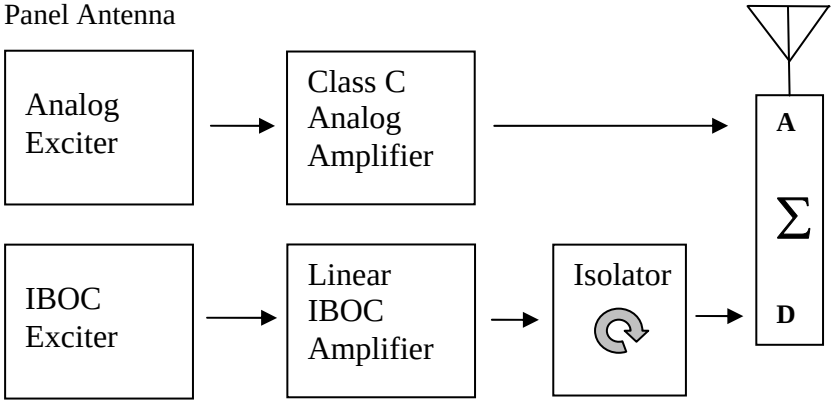


Figure 5 – Dual Input Antenna

2.5 Test Van Configuration

The mobile test platform used to collect field test data was identical in equipment and configuration to those used for previous iBiquity tests such as those conducted in 2002 in conjunction with the National Radio Systems Committee. The receiver used was a typical off the shelf consumer after market car radio (JVC KD-HDR50)

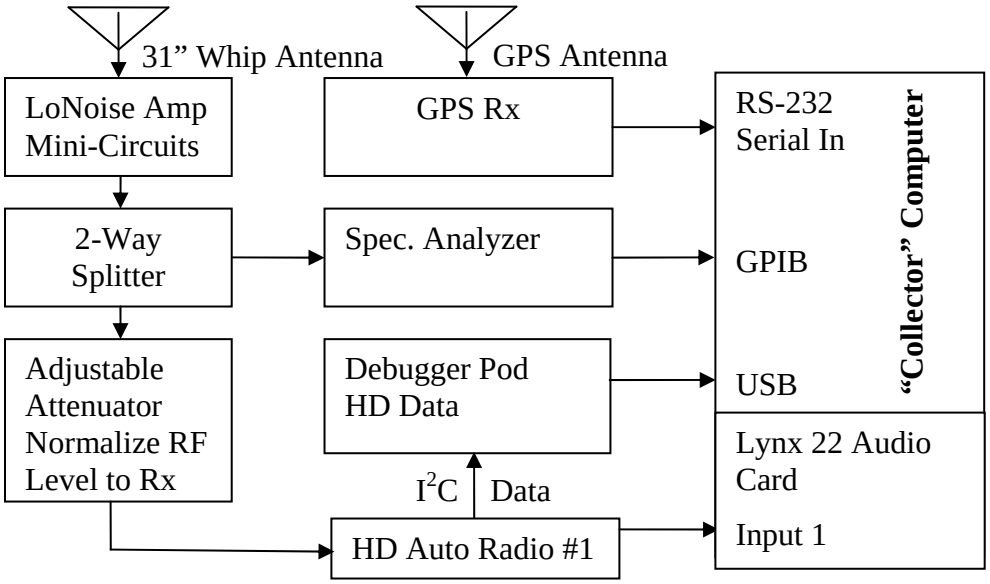


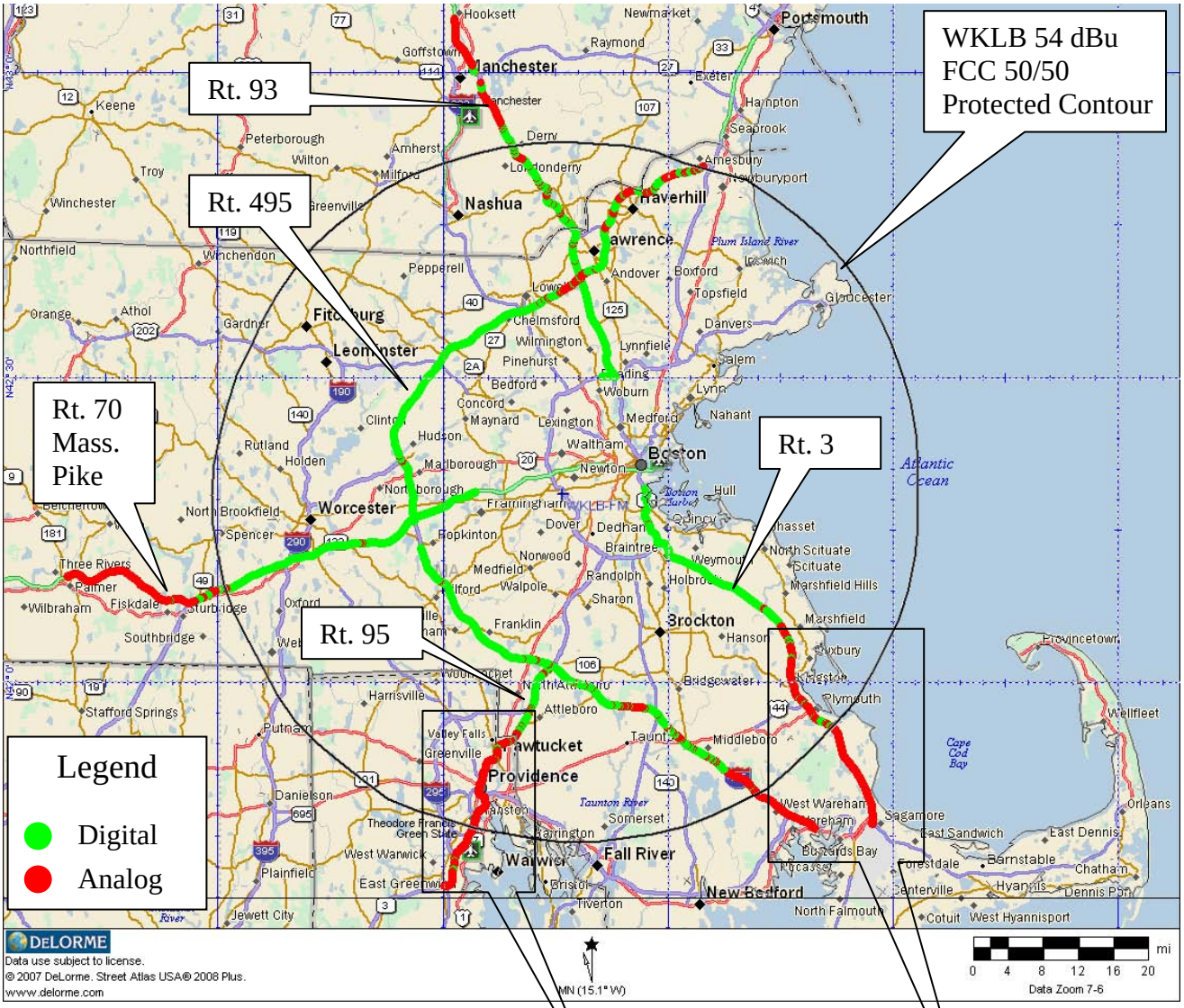
Figure 6 – Mobile Test Platform

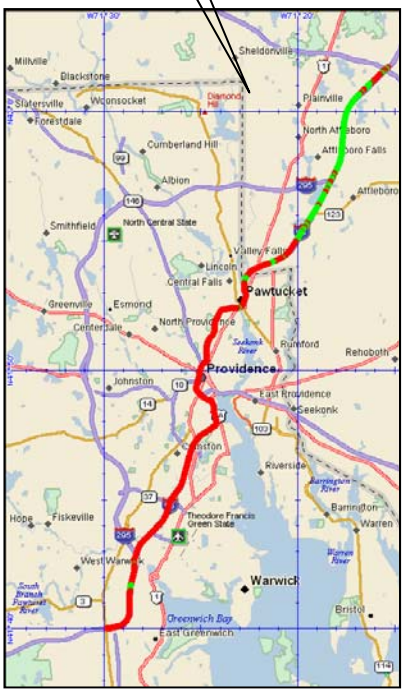
2.6 Route Selection

Five heavily travelled routes in the WKLB 54 dBu F 50/50 protected contour were chosen for testing.

Four radial routes (Routes 93, 70, 95 & 3) characterize the point of failure for the digital signal at various digital power levels. A fifth concentric route (Route 495) was chosen to examine the potential improvement in the commuter listening experience as the digital power was increased.

3 WKLB Performance Runs





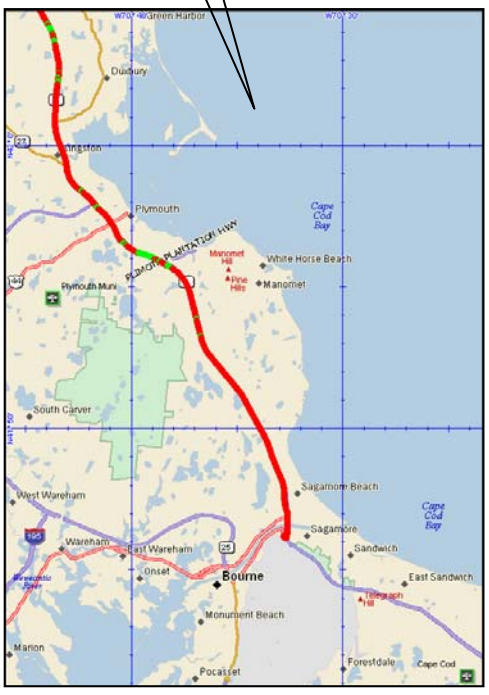


Figure 7 - WKLB @ -20 dBc

(-19.21 dBc in Mode MP3)

These maps show significant shortfall in coverage for the important suburban Boston communities of Lowell, Andover, Lawrence and Haverhill, MA to the North and Plymouth MA, Pawtucket and Providence, RI to the South. In addition, numerous areas of the heavily traveled Rt. 495 "beltway" experience severe dropouts of the HD Radio™ signal. It is apparent that WKLB cannot deliver commuters acceptable digital service at a power level of -20 dBc.

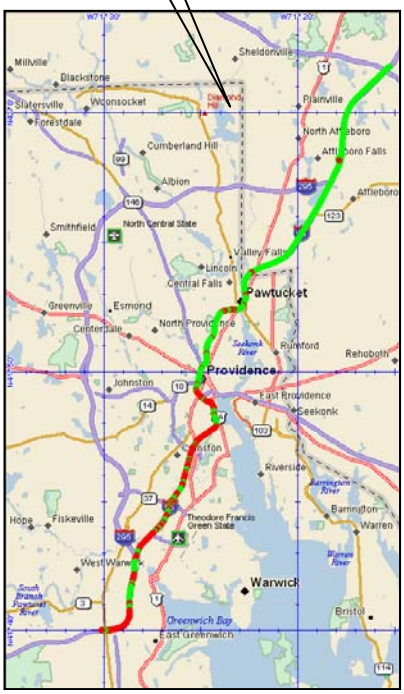


Figure 8 - WKLB @ -14 dBc

(-13.21 dBc in Mode MP3)

Increasing the digital power by 6 dB (to -14 dBc) dramatically improves the HD Radio™ listeners experience on heavily traveled Rt 495. Beltway commuters North of Lowell and South of Attleboro can now receive WKLB's multicast programming without interruption. Coverage in Pawtucket and Providence improves, but dropouts of multicast reception here will cause listener tuneout. Vacationers stuck in Cape Cod weekend traffic on Rt 3 will likewise lose the WKLB multicast signal.

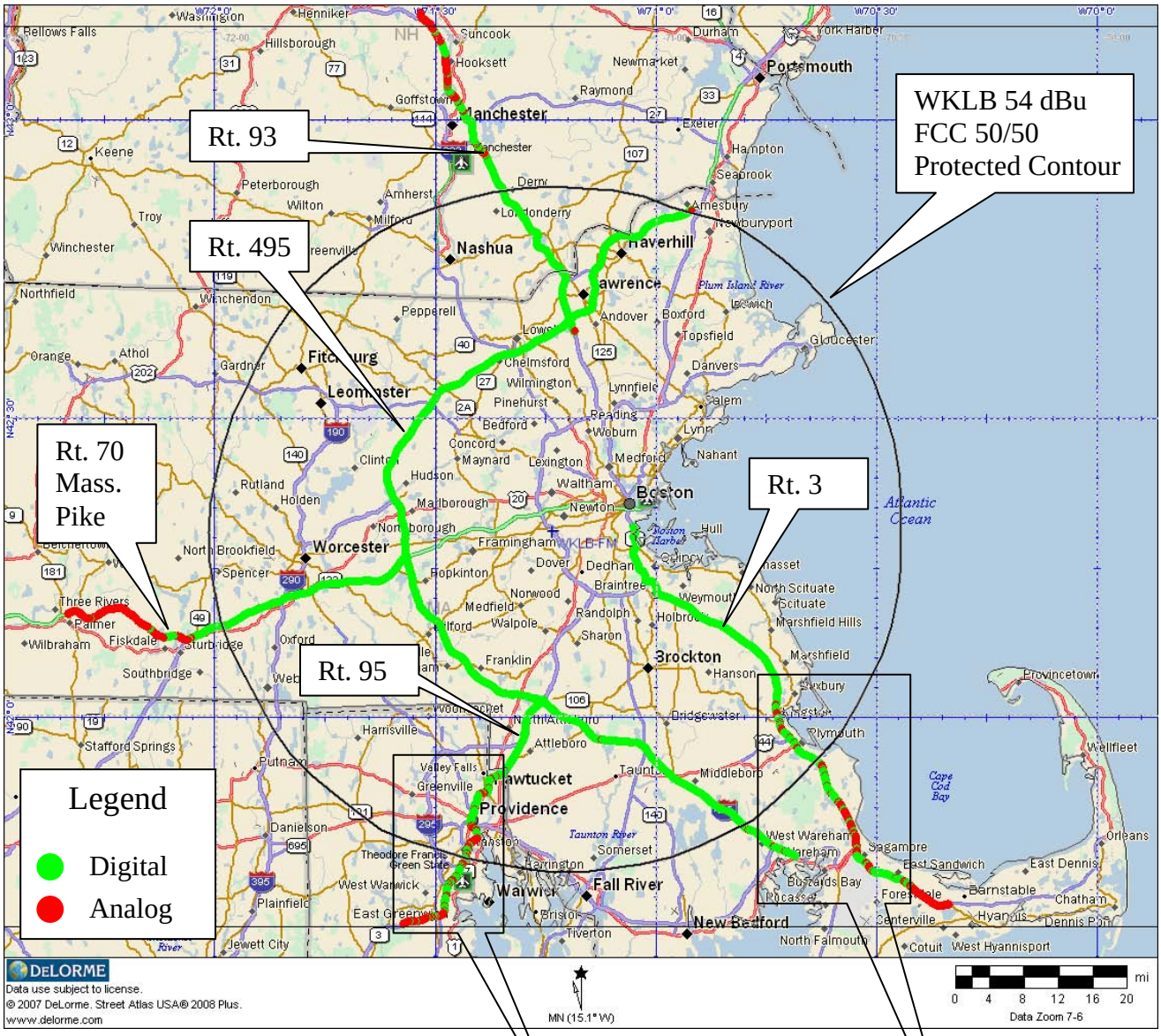
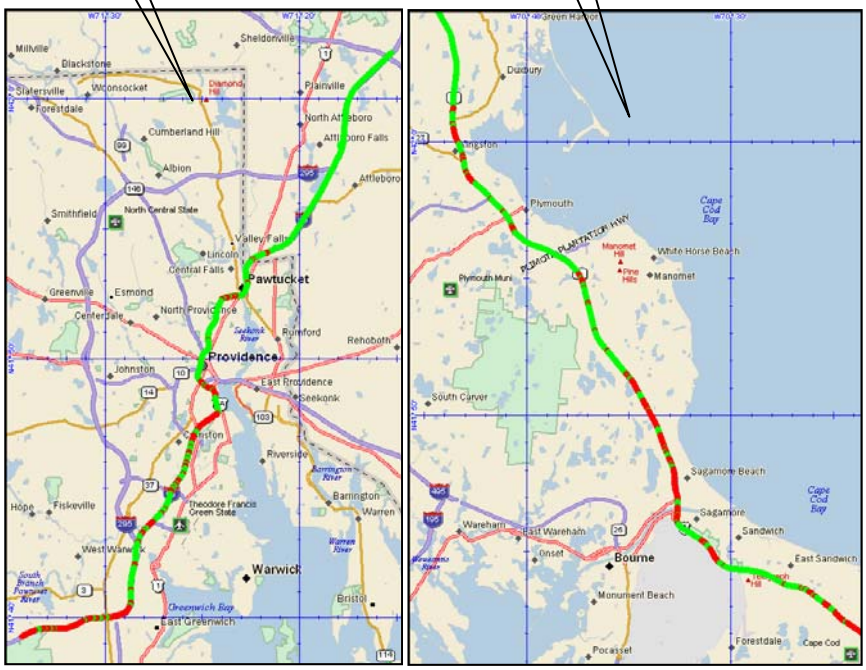


Figure 9 - WKLB @ -10 dBc

(-9.21 dBc in Mode MP3)

A full 10 dB digital power increase (to -10 dBc) appears to be the solution to most WKLB mobile reception issues. The only areas still compromised are low spots in Plymouth, Pawtucket and Providence.



FM HD Radio™ System Performance

In Building Interiors

At Elevated Digital Carrier Levels

July 1, 2009

Charles River Broadcasting Company

iBiquity Digital Corporation

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1 Background and Test Observations

On December 4, 2008, Charles River Broadcasting Company (Charles River), a subsidiary of Greater Media, Inc. and licensee of WKLB-FM Waltham, MA, was granted experimental authority by the FCC (file number 20081031ACO) to operate with digital carrier levels up to and including -10 dBc. This permitted WKLB to operate with digital power levels up to and including 10 dB above that currently permitted by the Commission's rules. WKLB has operated at various elevated digital power levels during the duration of the experimental authority and recently filed an interim report with the Commission, coincident with its request for an extension of such authority, detailing its observations during this period. It was noted in the interim report that WKLB would shortly be conducting additional testing to better quantify the actual improvements occasioned by operation at the elevated digital power levels.

During the past month, Charles River, with the assistance and cooperation of iBiquity Digital Corporation (iBiquity), the developer of the HD™ Radio system, has conducted extensive field testing in an effort to quantify improvements in the WKLB digital service occasioned by increasing power to several discrete levels. Although at least one previous study (conducted by CBS Radio) has been completed pertaining to the relative ability of digital signals - at various power levels - to achieve penetration of structures, it is believed that the instant report (see "FM HD Radio System Performance In Building Interiors At Elevated Digital Carrier Levels", immediately following) adds appreciably to that body of knowledge and expands the universe of receivers to include an about-to-be released battery operated portable "armband" HD Radio Receiver. Observations were made in a number of varied structures representative of the majority of those existent in the Greater Boston area and, indeed, the entire United States.

Six different locations were selected to be representative of the most common types of building construction. Location one, the Greater Media studio building in the Dorchester section of Boston is representative of low rise (two story) masonry, steel and glass construction. Location two, The Caning Shop in the Cambridge section of Boston, is a single story structure (with an occupied lower level) of wood and masonry construction. Location three, the Prudential Tower, in the Back Bay section of Boston, is a high rise skyscraper of steel, aluminum and glass construction. These locations (1-3) are all located within the urban core of Boston, within 8-10 miles of the WKLB-FM transmission facility in Needham, MA. Location four is a typical two story, split level residence in Andover, MA, of wood frame construction. Location five, the headquarters of the Comrex Corporation in Devens, MA, is a two story steel framed, wood building typical of many small to medium size commercial structures. Location six is a three story apartment building in North Attleboro, MA of poured concrete (with rebar) construction. Locations 4-6 are located at approximately the edge of digital coverage assuming the currently authorized -20 dBc power level. As detailed in the test report, two receiver models were used in the testing. A Sony XDR-S10HDiP table radio, one of the better performing receivers of this genre, was used for evaluation at numerous fixed locations within each structure. As many as four of these receivers, operated with associated manufacturer supplied antennas, were utilized simultaneously to characterize reception at various locations within each structure. The second receiver, a KRI portable arm band radio, was operated as it would be by a typical user, being moved about the interior of each structure to ascertain the availability of digital radio reception. All receivers utilized were characterized in the iBiquity Digital Corporation laboratory to verify that each met its published specifications.

Observations were made at each receiver, at each location and at each incremental power level to ascertain the availability of digital reception. In the case of the table (Sony) receiver, reception was characterized as either analogue, "flashing", indicating illumination of the HD mode indicator but not actual digital reception and "100%" indicating reception of the digital signal. In the case of the portable receiver, the approximate availability of digital reception, as expressed as a percentage, was noted as the receiver was moved about the area of interest. Actual field strength, as measured with a

Z-Technology Model R-507 field intensity meter with its associated calibrated antenna, was documented at each test location as well as at the exterior of each of the six structures evaluated.

Referencing location #1 in the attached report, it can be plainly seen that as one moves further into the interior of this building, digital reception becomes increasingly impossible at the – 20 dBc power level. Further, reception by the portable armband receiver is virtually nonexistent at any location within the building at the currently authorized power level. Keep in mind that this location is less than 10 miles from the class B transmission facilities of WKLB-FM. Increasing the digital power level to -12 dBc results in digital reception by the table radio at most location but -10 dBc is required to achieve any effective reception by the portable receiver.

At location #2, HD reception is possible at -20 dBc on the first floor level of the structure. However in the occupied basement level there is no HD reception whatsoever. At -14dBc reception at this location improves to 75% but -12 dBc is required to achieve 100% reliability on the tabletop receiver and -10 dBc is required for seamless reception on the portable.

Location #3, on the 26th Floor of the Prudential Tower Building, with direct line of sight to the WKLB-FM transmitter site in Needham, exhibited relative high levels of signal within the surveyed space resulting in good reception on the table radio in all areas with direct exposure to the large exterior windows. As one moved further into the building interior, increasingly higher levels of signal were required to maintain digital reception, with -16 dBc being necessary for digital reception at the building core. Performance of the portable receiver was appreciably worse. At the -20 dBc power level only 50% digital coverage was achieved in the space surveyed, with -10 dBc being required to achieve 95% coverage.

At the Andover residence (location #4) reception varied, as would be expected, depending on which floor (and thus which elevation) was surveyed. On the second floor, 100% HD reception on the table radio was achieved at -14 dBc while the armband receiver required -10 dBc for 85% digital reception. However on the first floor -10 dBc was necessary to achieve seamless reception on both the table and armband radios. At the basement level, -10 dBc was likewise necessary to achieve reliable table radio reception. The armband radio only achieved 20% reception at even the -10 dBc power level.

At the headquarters of Comrex, location #5, reception was again somewhat dependent on the floor level surveyed. On the second floor, a digital power level of -14 dBc produced acceptable reception at most fixed receiver locations (-10 dBc was required for seamless reception at all locations) while on the first floor only -10dBc resulted in reception at 50% of the locations. Reception by the portable receiver improved from 10% to 80% on the second floor and from 1% to 65% on the first floor with a digital power increase of 10 dB.

Location #6, an apartment building in North Attleboro, MA, exhibited no HD reception on any receiver at any location at the -20 dBc digital power level. In every case, -10 dBc was required to achieve digital reception on the table radio and to achieve reception at roughly 50% reliability on the portable receiver.

Conclusions

As can be readily ascertained from the test report and these comments, building penetration and thus the ability of listeners to readily receive digital radio signals in their workplaces and their homes is a significant challenge at today's -20 dBc digital power level. Put more bluntly, in many building types, digital reception is simply impossible on well performing table model receivers and similarly nonexistent on the new class of portable receivers about to be introduced into the market place. Although an incremental digital power may serve to partially mitigate the situation for plug in receivers in some fixed locations, only a full 10 dB increase will permit reliable service to portable

receivers and result in a close approximation of analogue coverage, two very basic and critical listener expectations.

2 Overview

This report documents recent field tests of iBiquity Digital Corporation's FM HD Radio™ system. The tests were designed to assess the effect of increasing HD Radio power to overcome building induced attenuation. These tests compare the system performance at current power levels (digital power 20 dB below analog power) and elevated power levels (up to 10 dB below analog).

2.1 IBOC Signal

For these tests, the system operated in the hybrid mode, which contains the analog FM signal and service mode MP3 digital carriers. Figure 1 illustrates digital carriers at -20 dBc and the FCC and iBiquity emission masks. The IBOC analog to digital carrier ratio is shown in a resolution test bandwidth of 1 kHz, which is far less than the total integrated power bandwidth of 140 kHz for the digital carriers. The -41.46 dBc ratio indicated in Figure 1 is calculated from the desired -20 dBc total integrated power ratio as follows:

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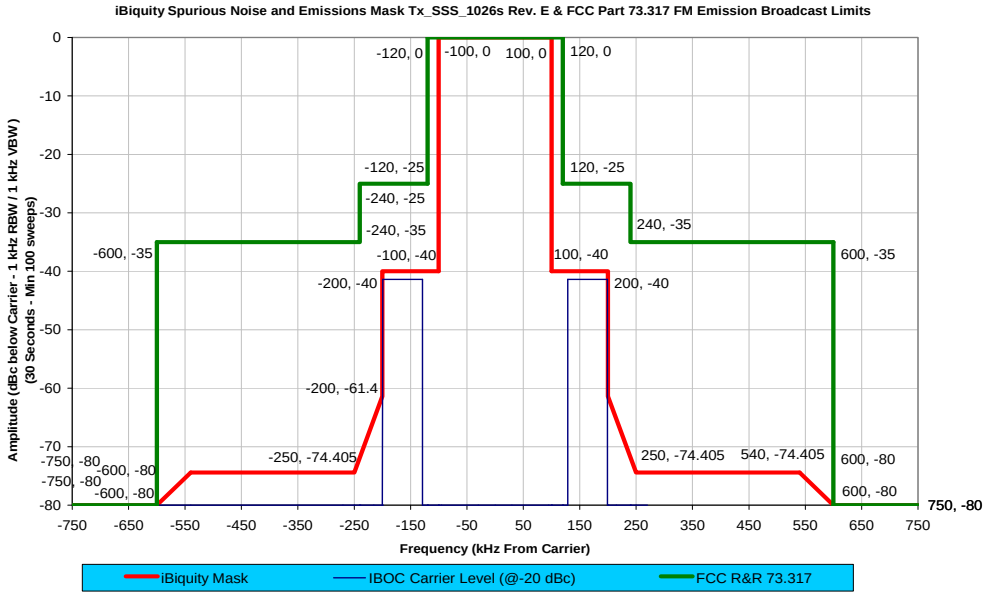


Figure 1 - FM Hybrid IBOC Spectral Test Mask @ -20 dBc

Figure 2 shows the RF spectrum from the forward sample port of a dual-input antenna, and the iBiquity spurious noise and emissions mask. The FCC Part 73.317 emission limit mask is not shown, as the iBiquity mask meets the FCC specification by a large margin.

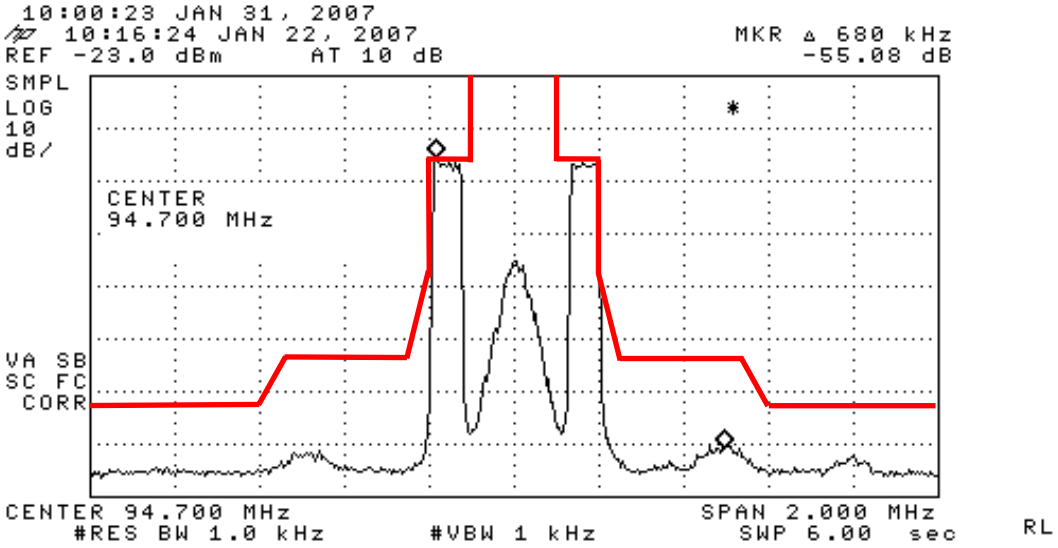


Figure 2 – Typical FM Hybrid IBOC Spectrum @ -20 dBc

Figure 3 shows the digital carriers at 10 dB below analog power levels with both the FCC and iBiquity masks. The digital sidebands will exceed the current iBiquity mask by about 8.5 dB. The digital sidebands comply with the FCC mask.

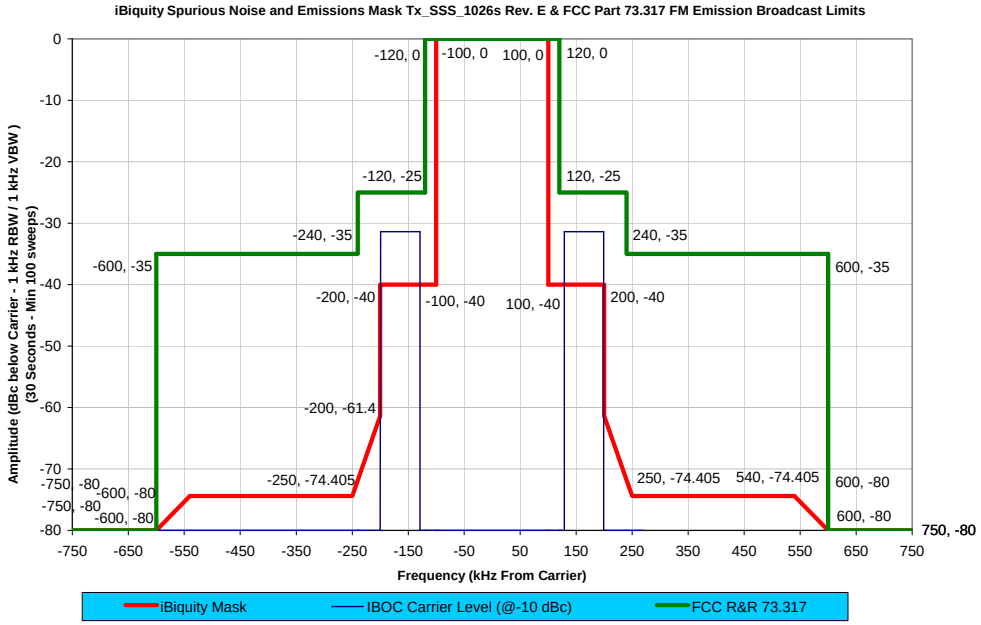


Figure 3 - FM Hybrid IBOC Spectral Test mask @ -10 dBc

Figure 4 shows the RF spectrum from the same sample point as Figure 2. As shown in Figure 3, the sideband power exceeds the current iBiquity digital mask in the frequency range of ±129 to ±199 kHz. Even at the -10 dB power level, the IBOC transmitter is capable of meeting or exceeding the iBiquity mask thresholds established for the -20 dB power level.

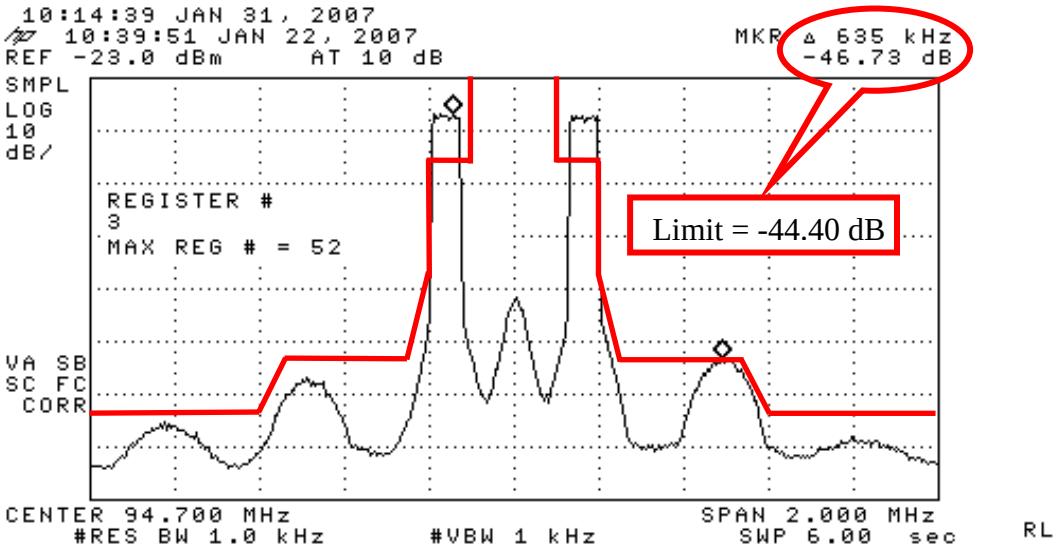


Figure 4 – Typical FM Hybrid IBOC Spectrum @ -10 dBc

2.2 Transmitter Test Site

These tests were conducted using the RF transmission facilities of WKLB, Waltham, MA (Boston).

WKLB was granted experimental authority under 47CFR 73.1510(d) to operate with digital power levels up to and including 10 dB above currently authorized levels.

Please note that WKLB's total integrated digital power is increased by 0.79 dB over the reference -20 / -14 / -10 dBc levels to accommodate the additional carriers present in transmission Mode MP3.

Transmission Facility Information

FCC Facility ID:	10542
North Latitude	42° 18' 37"
West Longitude	71° 14' 14"

High Power IBOC authority per 47CFR 73.1510(d) granted 12/4/08

Radiation Parameters

AGL	290 m	
G AMSL	30 m	
RC AMSL	320 m	
HAAT	272.27 m	
ERP (Analog)	14.0 kW	
ERP (Digital)	167.91 W	(-19.21 dBc D/A Ratio – Mode MP3)
ERP (Digital)	670.17 W	(-13.21 dBc D/A Ratio – Mode MP3)
ERP (Digital)	1679.1 W	(-9.21 dBc D/A Ratio – Mode MP3)

Antenna

ERI Model 1183-4CP-2 Dual-Input Hybrid IBOC

2.3 Operating Power

For these tests, WKLB chose to operate each transmitting facility at various total power levels from 20 dB to 10 dB below that of the reference analog carrier. The digital to analog power ratio was verified using digital power meters and transmission system loss / antenna gain calculations supplied by the equipment manufacturers.

2.4 Antenna Configuration

WKLB uses an ERI Model 1183-4CP-2 Dual-Input Hybrid IBOC Panel Antenna

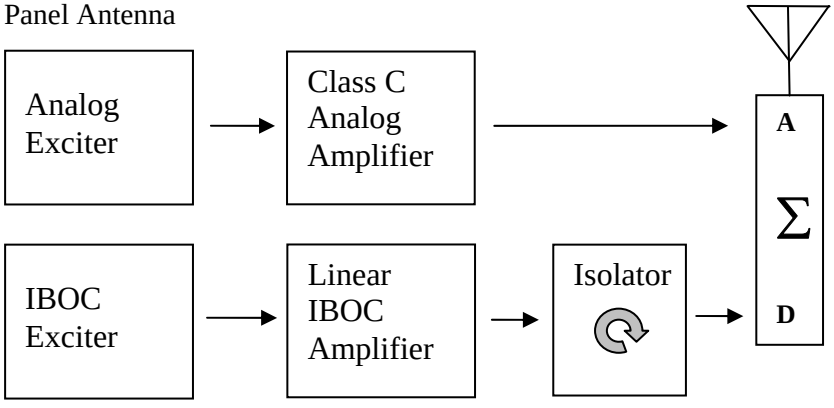


Figure 5 – Dual Input Antenna

3 Reception Test Bed

3.1 Test Equipment

A Sony XDR-S10HDiP tabletop receiver was used for the tests.

The radio was connected to the supplied dipole antenna, supported vertically by a custom made stand of PVC pipe. The manufacturer's antenna uses about 6 feet of unshielded twin-lead feeder cable. This cable not only acts as part of the antenna, but tests in iBiquity's semi-anechoic chamber showed losses of up to 8 dB over a reference dipole fed by coaxial cable. Nevertheless, the manufacturer's antenna was used in an effort to replicate the listener experience.

Somewhat anecdotal testing was done at each location with the new KRI "armband" portable radio, which is due on store shelves this summer.

FM analog field intensity was measured in dBuV with a Z-Technology model R-507 field intensity meter connected to an ETS-Lindgren model 3121C-DB2 calibrated dipole antenna whose elements had been adjusted to the proper length. The antenna was used in vertical polarization only to minimize h-pol directional effects.

3.2 Test Description

Two types of tests were performed:

1. Building Attenuation

   a. Vertically polarized field intensity (in dBu) was measured at all test locations. An average reading was obtained by slowly moving the calibrated antenna of the Z-Technology Field Intensity Meter in a one meter square area around the test location. The test antenna was removed to prevent measurement error due to parasitic coupling of elements.

   b. The absolute field intensity was read directly off the FI Meter in dBuV and tabullated.

2. Point of Digital Signal Acquisition

   a. Up to four Sony radio receivers were placed randomly around each of the test areas. The digital power was increased in 2 dB steps from -20 dBc to -10 dBc until the radio solidly locked onto the digital signal. The point of digital signal acquisition was tabulated for each receiver.

3.3 Test Environment

A range of test sites in downtown Boston and its suburbs were used for the tests. Locations were chosen to fully characterize a wide range of building types and reception environments.

WKLB High Power Building Penetration Test Locations

Location #1
Greater Media
55 Morrissey Blvd
Boston, MA 02125

N 42° 19' 09.93"
W 71° 03' 00.65"

Location #2
The Caning Shoppe
200 Elm St.
N. Cambridge, MA 02140

N 42° 23' 35.29"
W 71° 07' 14.60"

Location #3
Prudential Tower
800 Boylston St. / 26th Floor
Boston, MA 02140

N 42° 20' 49.78"
W 71° 04' 57.08"

Location #4
Residence
104 Haggetts Pond Rd.
Andover, MA

N 42° 38' 53.02"
W 71° 12' 50.35"

Location #5
Comrex Corporation
19 Pine Rd
Devens, MA 01434

N 42° 32' 35.90"
W 71° 37' 11.40"

Location #6
Residence
641 S. Washington St.
N. Attleboro, MA

N 42° 23' 35.29"
W 71° 07' 14.60"

Sites 1, 2 and 3 are typical downtown Boston receiving locations. Even though none are farther than 10 miles from the WKLB transmitter site, they all potentially can suffer from the "urban reception dilemma". Since many commercial buildings are metallic construction, shadowing, reflection and parasitic reradiation of the HD Radio signal can cause it to fail. Excessive urban electrical noise only augments the problem.

Sites 4, 5 and 6 are representative residences and an office building at the edge of digital coverage for currently authorized IBOC power levels.

4 Test Results

4.1 Structure Type Attenuation Characterization

Review of the data on the following pages show that the greatest amount of structural attenuation occurs in metallic buildings, or those using metal in construction. Visible metal such as window mullions as well as hidden building superstructures and concrete reinforcing rods all can potentially reflect or direct the RF signal. The Greater Media Studio building (Location #1), the 26th floor of the Prudential building (Location #3) and Residence #2 (Location #6) all demonstrate the above. Additionally, concrete and steel apartment buildings (Location #6) easily render the HD Radio signal unreceivable in core units. Wood frame dwellings and offices (Locations #4 & 5) without metalized vapor barriers or aluminum siding do little to block the FM signal. Likewise, concrete block structures without metal reinforcement (Location #2) have minimal effect on reception.

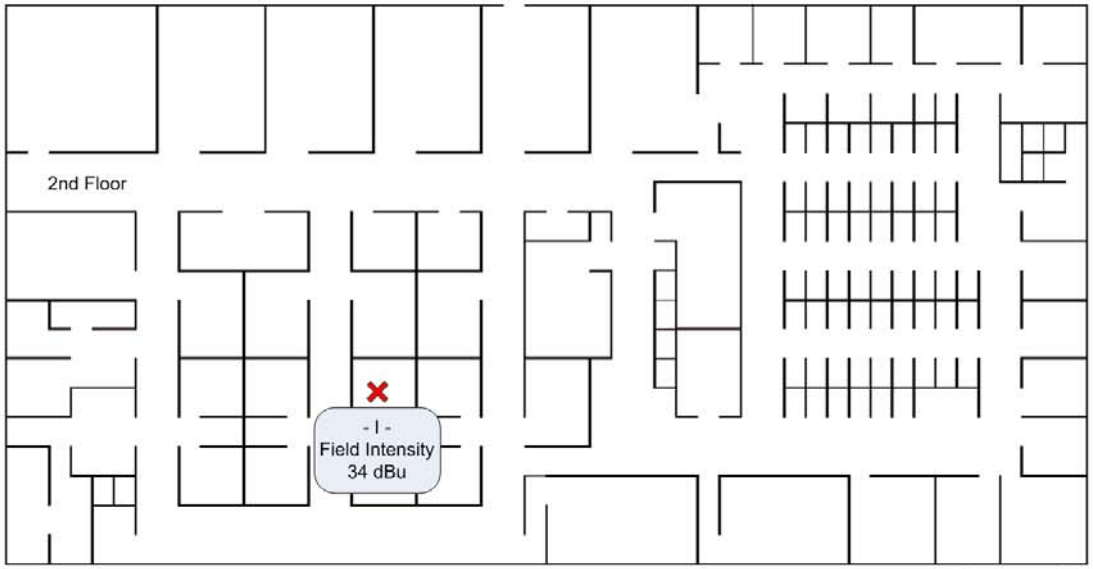
4.2 Real World Collateral Effects

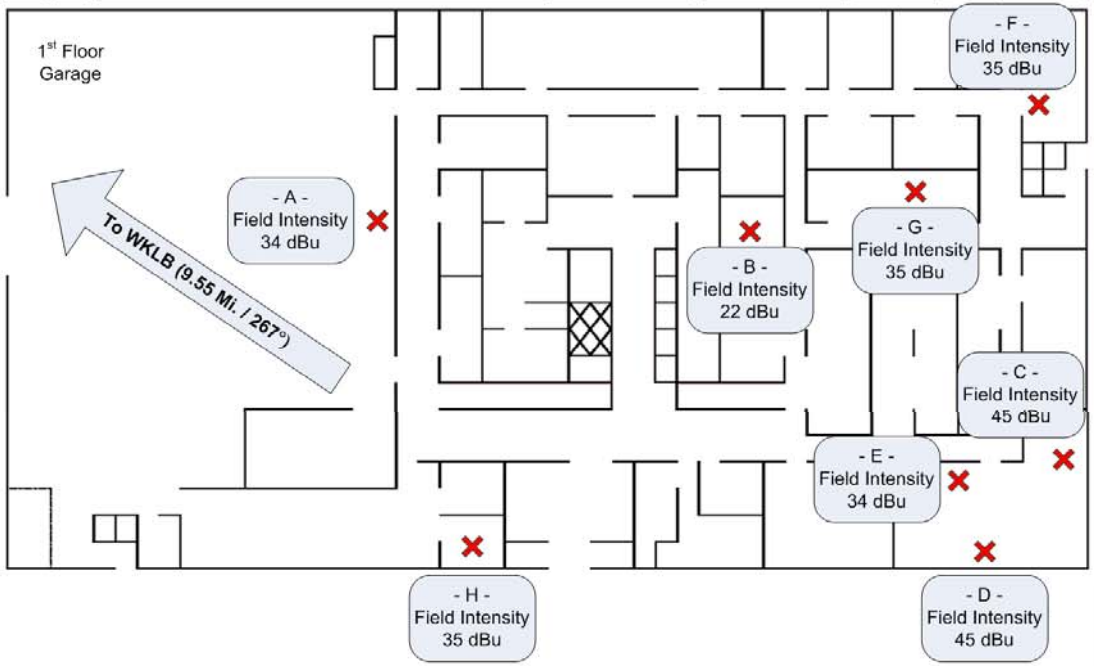
If it is true that poured concrete structures present such a barrier to FM HD Radio signals, then the core of daytime in-office listeners will be cut off from their favorite multicast HD Radio programming (and any revenue generating advertising). It seems reasonable to assume that office workers who are blocked from HD Radio reception at their desk or on their armband radios, drive home listening to their favorite format, only to be barred from reception in their apartment.

Listeners using a portable “armband” type HD Radio receiver can expect dropouts as they walk around the workplace, even in areas characterized by a high outdoor signal level. Armband radio listeners on the 26th floor of the Prudential Tower can only expect solid HD Radio reception if the transmitter is operating at a full -10 dBc digital to analog ratio.

4.3 Solutions

Whereas an intermediate power increase of 6 dB appears to substantially improve mobile reception, a full 10 dB of HD Radio transmitter power increase is necessary to achieve analog parity indoors, especially in shielded buildings.





D/A Power Ratio (dBc) →		-20	-18	-16	-14	-12	-10
Portable Armband Rx's	FI (dBu)	% Reception on Walking Tour					
Cafeteria (C,D,E)	Varies 45 - 34 dBu	5%	5%	10%	20%	25%	35%
Accts Payable (F)		10%	15%	20%	25%	30%	50%
Shulins Office (H)		0%	0%	0%	10%	15%	20%
2nd Fl WBOS PD (I)		0%	0%	20%	30%	50%	95%
1st Floor Tabletops		Front Panel LCD Display					
Loc. "A" Sony	34	None	None	None	Flash	100%	100%
Loc. "B" Sony	22	None	None	None	None	None	None
Loc. "C" Sony	45	100%	100%	100%	100%	100%	100%
Loc. "D" Sony	45	100%	100%	100%	100%	100%	100%
Loc. "E" Sony	34	None	None	Flash	100%	100%	100%
Loc. "F" Sony	35	None	Flash	100%	100%	100%	100%
Loc. "G" Sony	25	None	None	None	None	None	None
Loc. "H" Sony	37	None	None	Flash	100%	100%	100%
2nd Floor Tabletops		Front Panel LCD Display					
Loc. "I" Sony	34	None	None	None	Flash	100%	100%
Outside Tabletop		Front Panel LCD Display					
Loc. "J" Sony	54	100%	100%	100%	100%	100%	100%

Location #1

Greater Media
55 Morrissey Blvd
Boston, MA 02125

N 42° 19' 09.93"
W 71° 03' 00.65"

Two Story / Reinforced Concrete / Steel / Aluminum Construction
Scale: 1/32" = 1'

277711

Location #2

The Caning Shoppe
200 Elm St.
N. Cambridge, MA 02140

N 42° 23' 35.29"
W 71° 07' 14.60"

Single Story
Cinder Block Construction

A - 1st Floor (FI = 52 dBu):
HD Reception on Sony Tabletop and Portable Armband in all locations at -20 dBc

B - Basement (FI = 37 dBu):
Sony Tabletop:

-20 dBc:	No HD
-14 dBc:	75% HD
-12 dBc:	100% HD

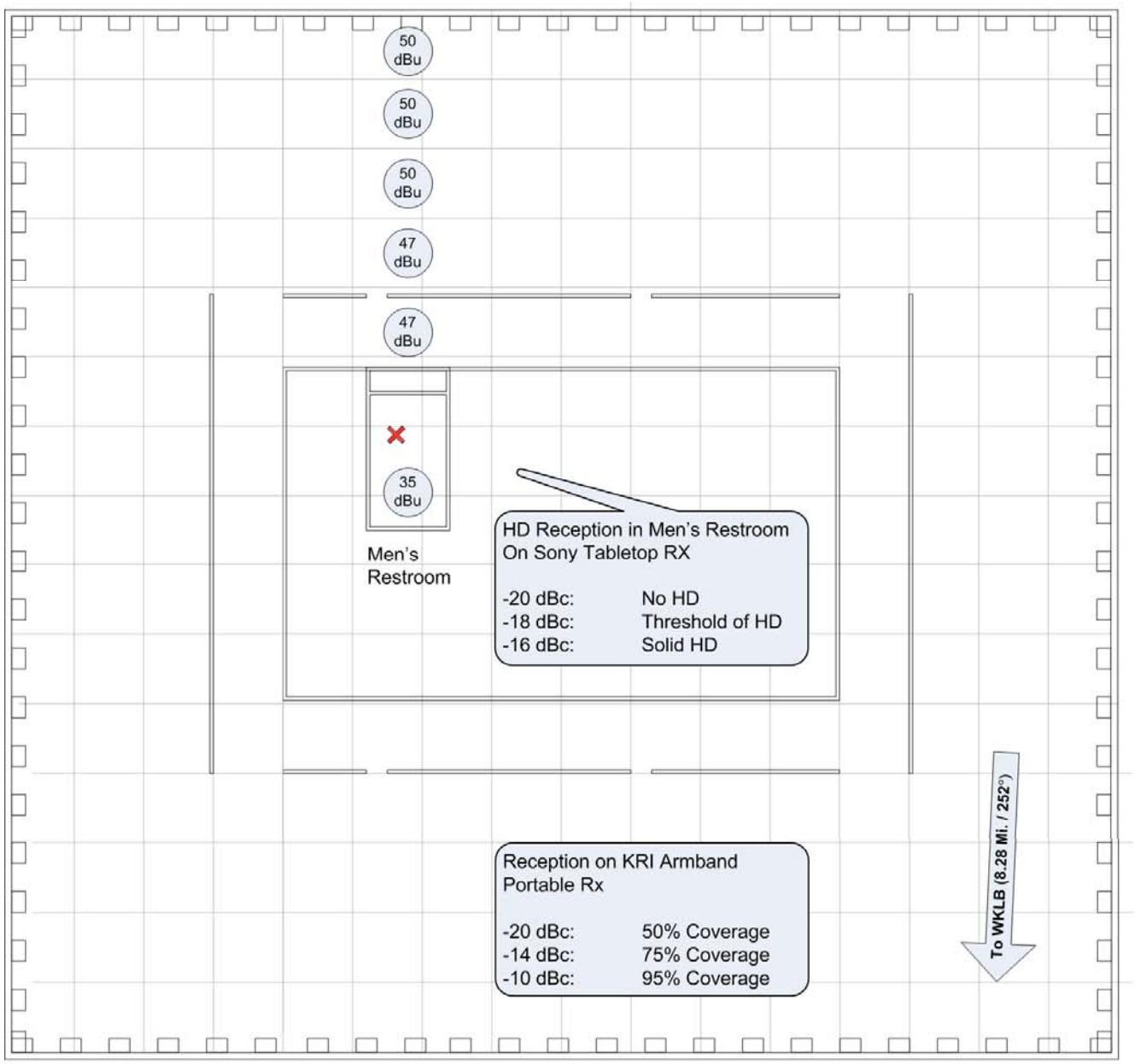
KRI Armband:

-20 dBc	No HD
-12 dBc	75% HD
-10 dBc	100% HD

C - Outside (FI = 52 dBu):
HD Reception on Sony Tabletop and Portable Armband in all locations at -20 dBc

Scale: 1/8" = 1'
Gray Grid is 10' X 10'

Windows w/ Aluminum Mullions (First Floor)
Cinder Block
Cinder Block Dividers in Basement
Cinder Block Dividers in Basement
Cinder Block Dividers in Basement
Cinder Block
Field Intensity = 52 dBu
Test Location First Floor
To WKLB (8.23 Mi. / 226°)
Cinder Block Dividers in Basement
Cinder Block Dividers in Basement
Cinder Block Dividers in Basement
Field Intensity = 37 dBu
Test Location Basement
Stairs
Cinder Block
Test Location Outside
Field Intensity = 52 dBu



Location #3

Prudential Tower
800 Boylston St.
26th Floor
Boston, MA 02140

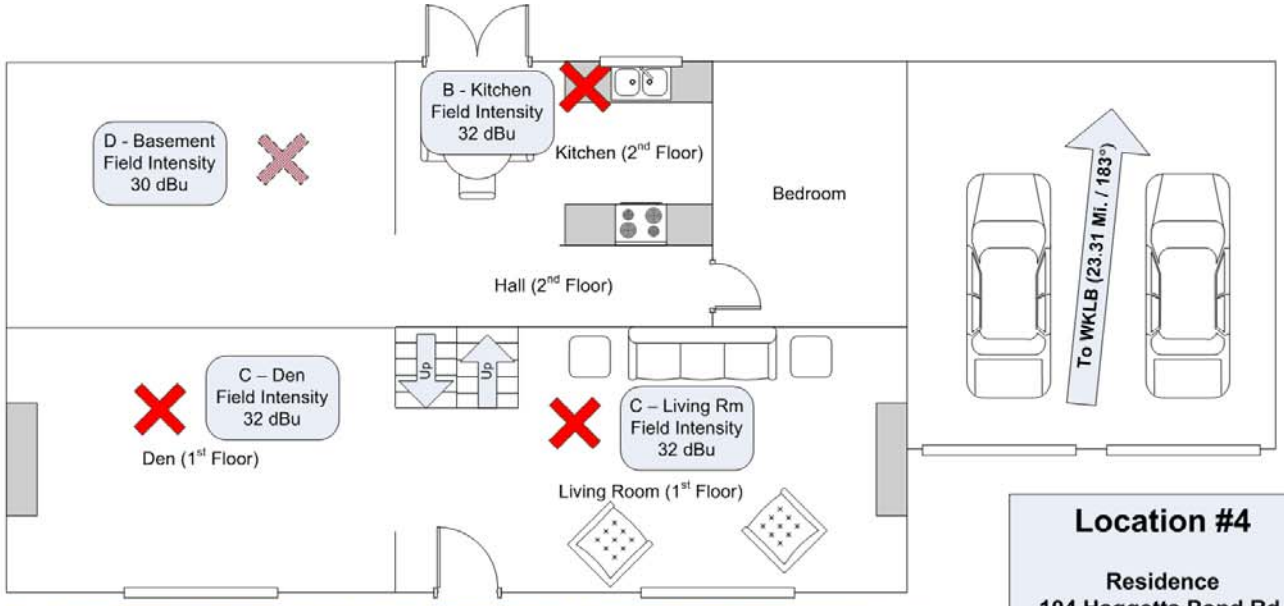
N 42° 20' 49.78"
W 71° 04' 57.08"

52 Floors
Glass & Aluminum Exterior
Steel Superstructure

Outside (N/A):

26th Floor (Fl = 50 dBu):
HD Reception in all locations except Men's Restroom at -20 dBc
(See Callout on Plan)

Scale: 0.05" = 1'
Gray Grid is 10' X 10'



Location #4

Residence
104 Haggetts Pond Rd.
Andover, MA

N 42° 38' 53.02"
W 71° 12' 50.35"

Split level / Wood Frame
Wood siding Construction

A - Outside (FI = 35 dBu):
Sony Tabletop:

-20 dBc:	50% HD
-14 dBc:	100% HD
-12 dBc:	100% HD
-10 dBc:	100% HD

KRI Armband

-20 dBc:	75% HD
-14 dBc:	90% HD
-12 dBc:	100% HD
-10 dBc:	100% HD

B - 2nd Floor Kitchen
(FI = 34 dBu):
Sony Tabletop:

-20 dBc:	20% HD
-14 dBc:	100% HD
-12 dBc:	100% HD
-10 dBc:	100% HD

KRI Armband

-20 dBc:	60% HD
-14 dBc:	70% HD
-12 dBc:	80% HD
-10 dBc:	85% HD

C - First Floor Living Room
& First Floor Den
(FI = 32 dBu):
Sony Tabletop:

-20 dBc:	Flashing HD
-14 dBc:	Flashing HD
-12 dBc:	75% HD
-10 dBc:	100% HD

KRI Armband

-20 dBc:	No HD
-14 dBc:	75% HD
-12 dBc:	100% HD
-10 dBc:	100% HD

D - Basement Room
(FI = 30 dBu) :
Sony Tabletop:

-20 dBc:	No HD
-14 dBc:	Flashing HD
-12 dBc:	75% HD
-10 dBc:	100% HD

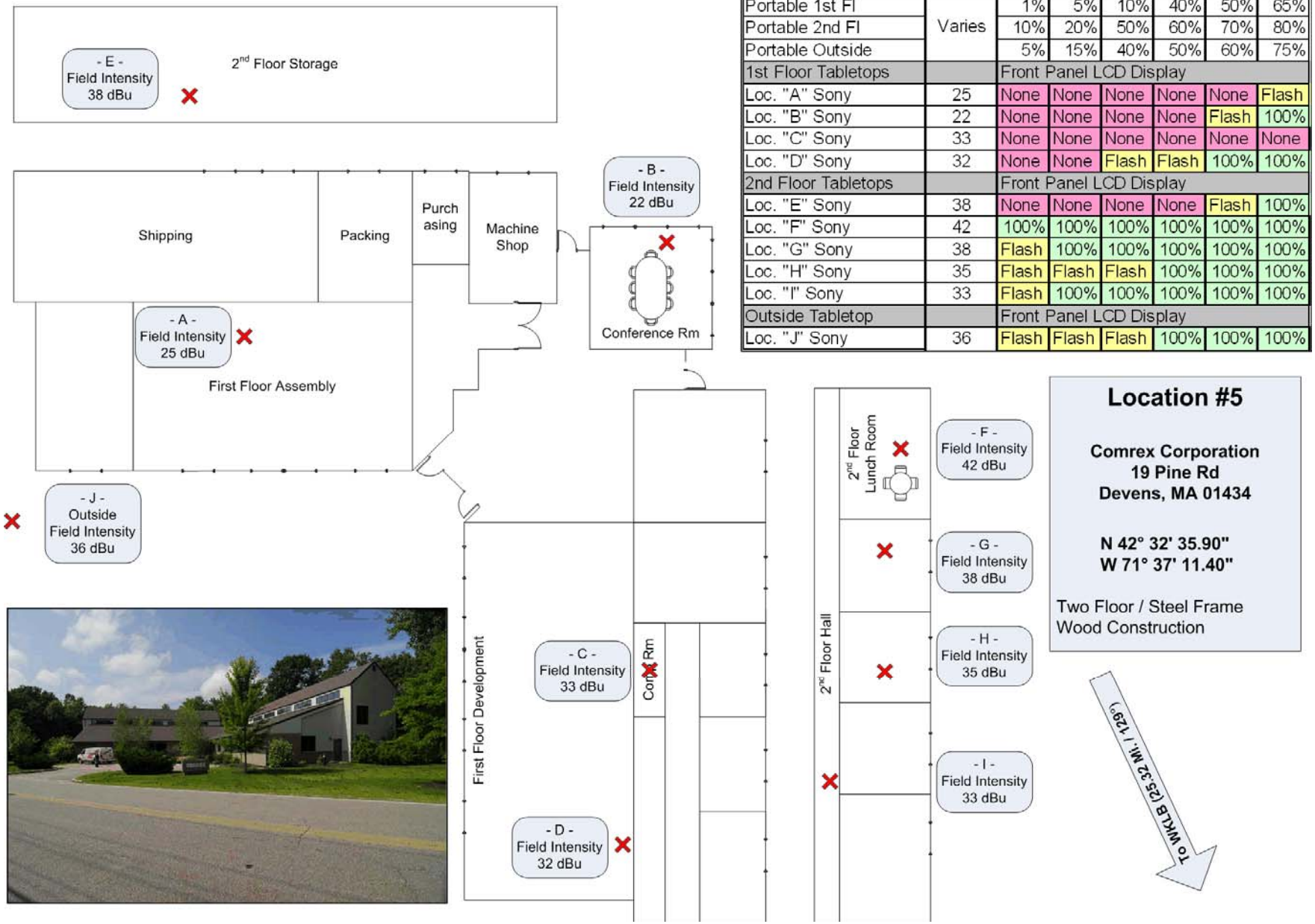
KRI Armband

-20 dBc:	No HD
-14 dBc:	No HD
-12 dBc:	10% HD
-10 dBc:	20% HD

Scale: 1/8" = 1'

SS

D/A Power Ratio (dBc) →		-20	-18	-16	-14	-12	-10
Portable Armband Rx's	FI (dBu)	% Reception on Walking Tour					
Portable 1st FI	Varies	1%	5%	10%	40%	50%	65%
Portable 2nd FI		10%	20%	50%	60%	70%	80%
Portable Outside		5%	15%	40%	50%	60%	75%
1st Floor Tabletops		Front Panel LCD Display					
Loc. "A" Sony	25	None	None	None	None	None	Flash
Loc. "B" Sony	22	None	None	None	None	Flash	100%
Loc. "C" Sony	33	None	None	None	None	None	None
Loc. "D" Sony	32	None	None	Flash	Flash	100%	100%
2nd Floor Tabletops		Front Panel LCD Display					
Loc. "E" Sony	38	None	None	None	None	Flash	100%
Loc. "F" Sony	42	100%	100%	100%	100%	100%	100%
Loc. "G" Sony	38	Flash	100%	100%	100%	100%	100%
Loc. "H" Sony	35	Flash	Flash	Flash	100%	100%	100%
Loc. "I" Sony	33	Flash	100%	100%	100%	100%	100%
Outside Tabletop		Front Panel LCD Display					
Loc. "J" Sony	36	Flash	Flash	Flash	100%	100%	100%

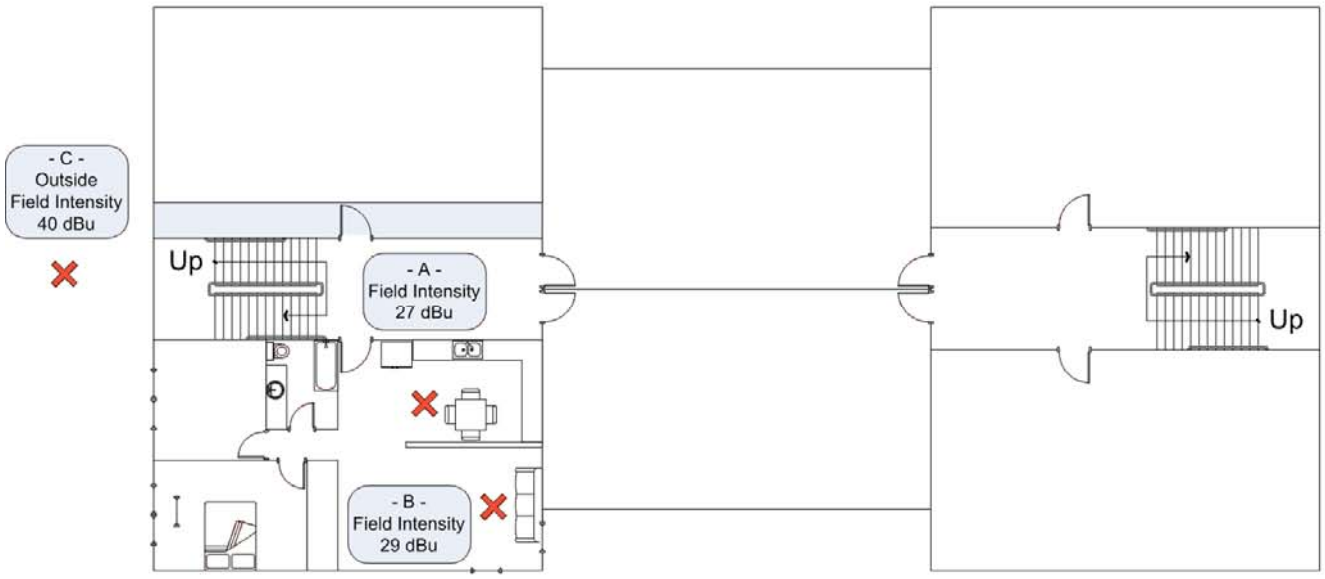


Location #5

Comrex Corporation
19 Pine Rd
Devens, MA 01434

N 42° 32' 35.90"
W 71° 37' 11.40"

Two Floor / Steel Frame
Wood Construction



To WKLB (24.72 Mi. / 13°)

Location #6

Residence
641 S. Washington St St.
N. Attleboro, MA

N 42° 23' 35.29"
W 71° 07' 14.60"

3 Story Apartment House
2nd Floor (Middle) Apartment
Poured Concrete and Rebar Construction

A - 2nd Floor Kitchen
(FI = 27 dBu):
Sony Tabletop:
-20 dBc: No HD
-12 dBc: Flash
-10 dBc: 100% HD
KRI Armband
-20 dBc: No HD
-12 dBc: 20% HD
-10 dBc: 45% HD

B - 2nd Floor Living Room
(FI = 29 dBu):
Sony Tabletop:
-20 dBc: No HD
-14 dBc: Flash
-12 dBc: 100% HD
KRI Armband
-20 dBc: No HD
-12 dBc: 30% HD
-10 dBc: 60% HD

C – Outside @ Front Door
(FI = 40 dBu):
Sony Tabletop:
-20 dBc: 100% HD
KRI Armband
-20 dBc: 75% HD
-14 dBc: 100% HD

Scale: 1/16" = 1'